

IN THE CLAIMS:

1 1-10. (Cancelled)

1 11. (Previously Presented) A method of dynamically controlling and managing oper-
2 ating characteristics of a fuel cell system, including the steps of:

3 (A) providing a DC-DC converter circuit having an input connection to re-
4 ceive the output of a fuel cell, and connected to place a load across the fuel cell, said DC-
5 DC converter circuit having internal switches that are operated at a duty cycle that is ad-
6 justable;

7 (B) providing a programmable controller that receives as an input, present and
8 stored values of one or more operating characteristics, said programmable controller also
9 being programmed to signal said DC-DC converter switches to adjust its duty cycle;

10 (C) identifying a weakest cell in a fuel cell stack;

11 (D) measuring the output voltage of the weakest cell;

12 (E) dynamically determining a desired value for said output voltage;

13 (F) comparing a present value of said weakest cell output voltage with a de-
14 sired value;

15 (G) calculating a new duty cycle for the associated DC-DC converter within
16 the fuel cell system required to substantially achieve said desired value for the output
17 voltage of the weakest cell; and

18 (H) signaling said DC-DC converter to adjust its duty cycle to said new duty
19 cycle.

1 12-14. (Cancelled)

1 15. (Currently Amended) A method of dynamically controlling and managing operat-
2 ing characteristics of a fuel cell system used to power a battery or an application device,
3 including the steps of:

4 (A) providing a DC-DC converter circuit having an input connection to re-
5 ceive the output of a fuel cell, and connected to place a load across the fuel cell, said DC-
6 DC converter circuit having internal switches that are operated at a duty cycle that is ad-
7 justable;

8 (B) providing a programmable controller that receives as an input, present and
9 stored values of one or more operating characteristics, said programmable controller also
10 being programmed to signal said DC-DC converter switches to adjust its duty cycle;

11 (C) dynamically determining a desired value for a plurality of operating char-
12 acteristics of the fuel cell system, depending upon the operating conditions of the fuel cell
13 system;

14 (D) measuring said plurality of operating characteristics;

15 (E) dynamically determining an output power of the fuel cell stack that does
16 not exceed a maximum power needed by at least one of the battery or the application de-
17 vice being powered by the system, but maintains said desired values of said operating
18 characteristics;

19 (F) comparing a present value of said output power with a desired value;

20 (G) calculating a new duty cycle for the associated DC-DC converter within
21 the fuel cell system required to substantially achieve said desired value for the output
22 power; and

23 (H) signaling the DC-DC converter to adjust its duty cycle to said new duty
24 cycle.

1 16. (Previously Presented) A method of controlling a fuel cell system, including the
2 steps of:

3 (A) dynamically determining desired values for a plurality of operating char-
4 acteristics being monitored in a current mode of operation of a fuel cell system;

5 (B) measuring each of said selected operating characteristics;

- 6 (C) determining a duty cycle required to substantially achieve each individual
7 desired value and storing each duty cycle;
8 (D) comparing stored values and selecting the minimum duty cycle; and
9 (E) using this duty cycle as the new duty cycle of the DC-DC converter circuit
10 switches within said fuel cell system.

1 17. (Previously Presented) The method as defined in claim 16 including the further
2 step of:

3 periodically repeating determining the desired values and the measurements and
4 updating the duty cycle.

1 18. (Withdrawn) A method of measuring fuel cell concentration in a fuel cell system:

2 (A) identifying the weakest fuel cell in a fuel cell stack;

3 (B) increasing the overall stack output current and varying the duty cycle of
4 DC-DC converter circuit switches coupled to said fuel cell system until the voltage of the
5 weakest fuel cell approaches zero;

6 (C) measuring the stack output current as a limiting current;

7 (D) determining whether concentration is too high or too low, based on the
8 measured current value; and

9 (E) dosing additional fuel or water should a desired value not be met.

1 19. (Previously Presented) A method of dynamically controlling and managing tem-
2 perature in a fuel cell system, including the steps of:

3 (A) measuring the stack output voltage of the fuel cell system;

4 (B) determining whether the stack output voltage is at a desired value depend-
5 ing upon the present desired temperature range of the fuel cell system, for the present op-
6 erating conditions, and

7 (C) adjusting the duty cycle of an associated DC-DC converter to change the
8 output stack voltage to substantially the desired value.

- 1 20. (Withdrawn) A method of dynamically controlling the output power of a fuel cell
2 system including the steps of:
- 3 (A) dynamically determining a desired value for the output power of the fuel
4 cell system, depending upon the present operating conditions of the fuel cell system;
- 5 (B) measuring the output power of the fuel cell system;
- 6 (C) if the desired value is not substantially met, measuring fuel concentration;
- 7 (D) adjusting fuel concentration to substantially achieve the desired value of
8 the output power of the fuel cell system; and
- 9 (E) adjusting the overall stack voltage by adjusting a duty cycle of associated
10 DC-DC converter circuit switches coupled to the fuel cell system to substantially achieve
11 the maximum output power of the fuel cell system.